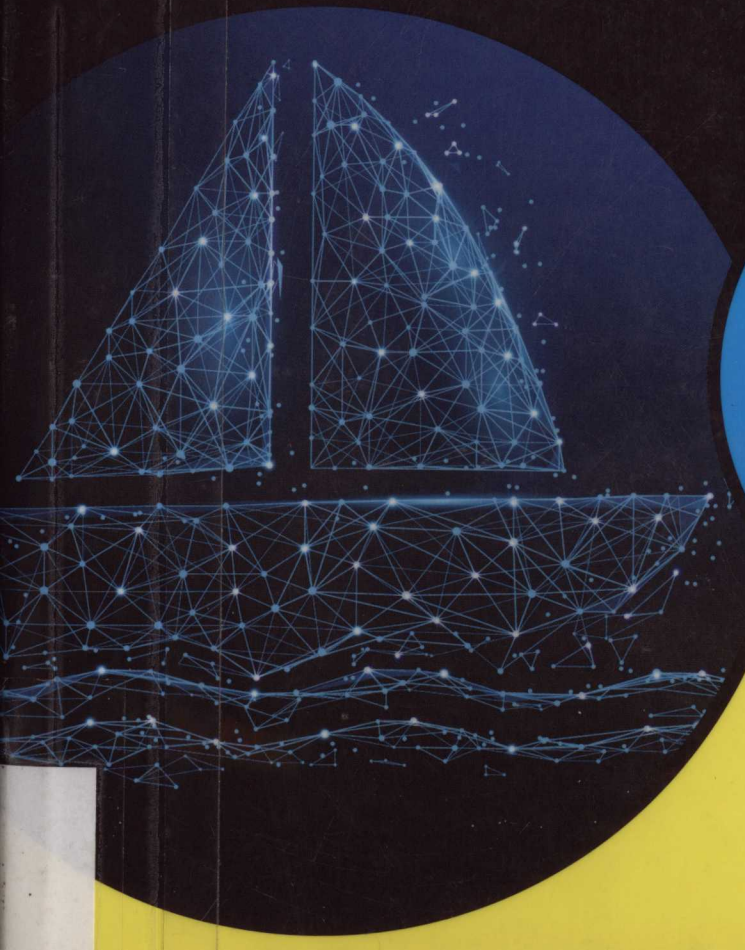
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## Inside...

- Add a data lake to your system
- Sync new data with existing data
- Migrate data to a data lake
- Analyze your data
- Scale up as your data grows
- Clean up a data dump
- Compare data lake solutions
- Troubleshoot your data

**Alan Simon** is the managing principal of Thinking Helmet, Inc., the author of 32 books on business technology, and a consultant who's worked with enterprise and government organizations. His professional focus is business intelligence, analytics, and data warehousing. He also teaches university courses in his specialty areas.

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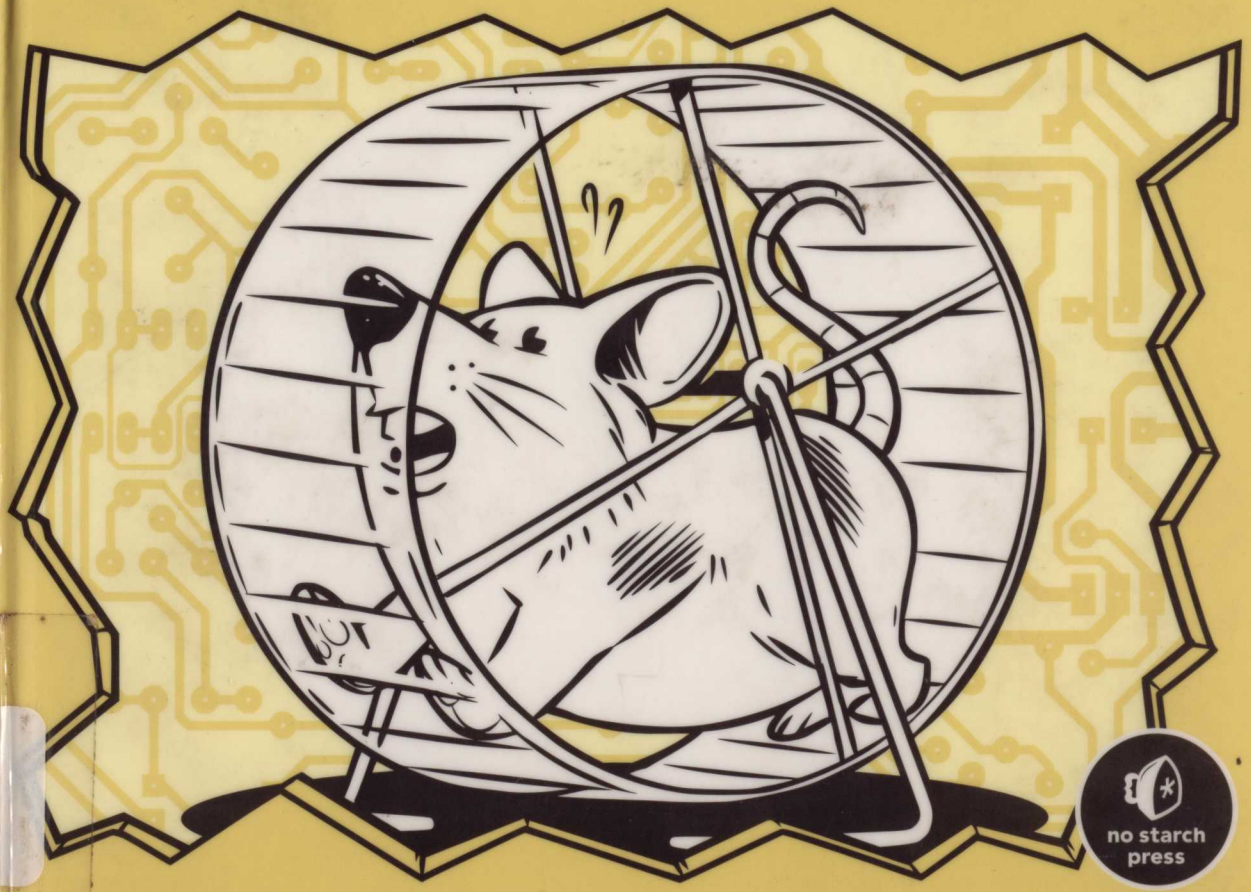
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# HOW SOFTWARE WORKS

## THE MAGIC BEHIND *ENCRYPTION*, *CGI*, *SEARCH ENGINES*, AND OTHER EVERYDAY TECHNOLOGIES

V. ANTON SPRAUL



no starch press

# HOME COMPUTERS:

## 100 Icons that Defined a Digital Generation

Text by Alex Wiltshire
Photography by John Short

ST

SDC Minivac 601
MITS Altair 8800b
Radio Shack TRS-80 Model III
Commodore PET 2001
Apple IIe
Rockwell AIM-65
Intertec Superbrain
Exidy Sorcerer
Atari 400 and 800
Science of Cambridge Mk 14
Research Machines 380Z
Acorn System 1
Sinclair ZX80
Acorn Atom
Radio Shack TRS-80 Color Computer 2
Commodore VIC 20
Hewlett-Packard HP85
Apple III
Sharp MZ-80K
Osborne 1
IBM 5150
Texas Instruments TI 99/4A
Sinclair ZX81
Acorn BBC Microcomputer Model A
EACA Genie II EG 3008
Commodore 64
Sinclair ZX Spectrum
Jupiter Cantab ACE
Dragon 32
Oric -1
Research Machines Link 480Z
Sord M23 Mark III
Commodore PET 8032 SK
C/WP Cortex
Computers Lynx 96
DEC Rainbow
Olympia People
Apricot PC
Micro Networks Samurai S16
Compaq Portable
Timex Sinclair 1500
Mattel Aquarius
Atari 600XL
Spectravideo SVI 328 MK II
Toshiba HX-10
Canon V-20
Matra Alice
VTech Laser 200

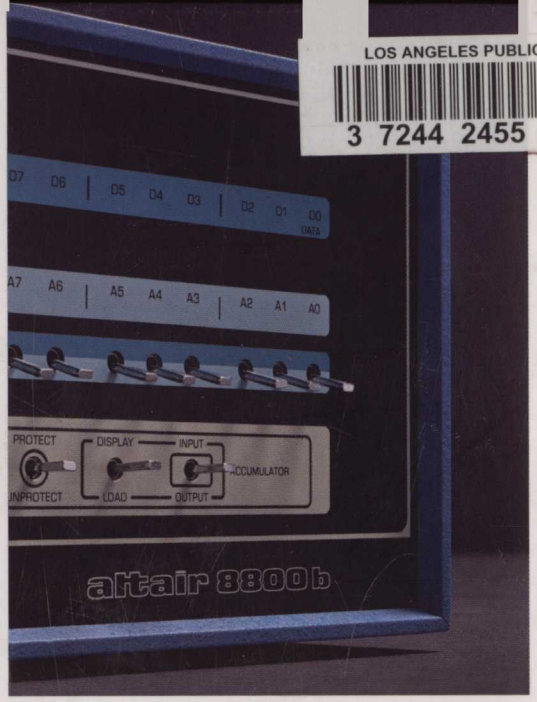
Acorn Electron
Memotech MTX 51
Philips P2000C
Apple Lisa 2
Apple Macintosh
Sinclair QL
Oric Atmos
Amstrad CPC 464
Tatung Einstein TC-01
ICL Merlin Tonto
Commodore 116
Commodore SX-64
Commodore Plus/4
Microdigital TK90X
Sinclair Spectrum 128K
Amstrad CPC 6128
Enterprise One Two Eight
Atari 65XE
Commodore 128
Atari 520 ST FM
Commodore Amiga 1000
Matra Alice 90
Thomson MO6
Casio MX-10 Type B
Apple IIGS
Tandy 1000 EX
Amstrad PC1512 DD
Tatung Einstein 256
Acorn BBC Master 128
Acorn Archimedes A440
Cambridge Z88
Sinclair PC 200
Amstrad PPC 512
Dell 316SX
NeXT Computer
Coupil Golf 286
Olivetti Prodest PC1
Robotron KC 87
Orel BK-08
Didaktik M
MGT SAM Coupé
Amstrad 464plus
Atari Portfolio
Atari STacy2
Apple Macintosh Portable
Atari TT030
Commodore Amiga A-500 Plus
Acorn A3010
Acorn RiscPC 600
Apple iMac G3

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It took a mere fifteen years for home computers to develop from DIY kits for garage hobbyists to internet-powered necessities for every household. An industry exploded and everyday life would never be the same. Countless new computers and companies were born or went bust, fortunes were won and lost. The generation of children who grew up on machines like the ZX Spectrum and Commodore 64 went on to originate seminal videogames and new forms of digital media.

Through the 100 most important examples of digital ingenuity, industrial design and marketing savvy, this lovingly assembled book relates the early stories from the dawn of the digital age and the people and computers behind them.

The digital revolution brought brilliant invention and cut-throat business, avarice and philanthropy, invention and piracy. The early computers that captured the progress and promise of this period and entered our homes are today objects of affection and admiration. Little did we know how much more was to follow.




↑ Intertec Superbrain, Intertec Data Systems, 1979 ↓ MITS Altair 8800b, Micro Instrumentation and Telemetry Systems, 1975 ↘ Commodore Pet 2001, Commodore International, 1977 → Sinclair ZX Spectrum, Sinclair Research, 1982







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# APPLE IIE




**ORIGIN**
United States

**TECHNICAL DATA**
Synertek 6502 at 1 MHz, 64 KB RAM

**AVAILABLE**
January 1983

**MANUFACTURER**
Apple Computer

Not every groundbreaking computer was about delivering blistering power and speed. On its release in June 1977, the Apple II featured the same processor, running at the same clock speed, as the Apple I, the single-board kit that computer engineer Steve Wozniak had designed the previous year. But it launched what would become the most valuable company in the world and changed attitudes about how computers should look, run, and feel. Rather than power, the Apple II was about refinement.

Steve Wozniak began to design the Apple II's insides while still a Hewlett-Packard employee, but he soon left to join Apple full-time, working to a philosophy that he set out in *Byte* magazine as follows: 'A personal computer should be small, reliable, convenient to use and inexpensive.' In order to make the machine as economic as possible, he used ingenious ways of controlling the frequencies of each component and avoiding interruptions of the video stream without requiring extra chips and circuits. Although the base 4-KB model cost a hefty $1,298, it could display colour, unlike the other all-in-one computers that came out that year.

Apple's founder, Steve Jobs, recruited Jerry Manock, a freelance industrial designer, to create the Apple II's casing for $1,500, asking for a machine that would sell beyond the hobbyist community. Jobs didn't want fans or vents; he knew that a major source of heat was the power supply, so he asked engineer Rod Holt to design one that oscillated on and off far quicker than standard ones. Jobs claimed its design was as important as Wozniak's celebrated logic board.

Various versions followed the Apple II's release, including the Apple II Plus in 1979, which had improved graphics and included Apple BASIC in its ROM, and the IIe in 1983. The 'e' stood for 'enhanced'; aside from more RAM, it also had a full ASCII character set, which included lower-case letters and the logo-adorned modifier key that can still be found on Apple keyboards today. Remaining in production all the way up to November 1993, the IIe was the most popular model of this legendary computer, but many more were to come P. 60.

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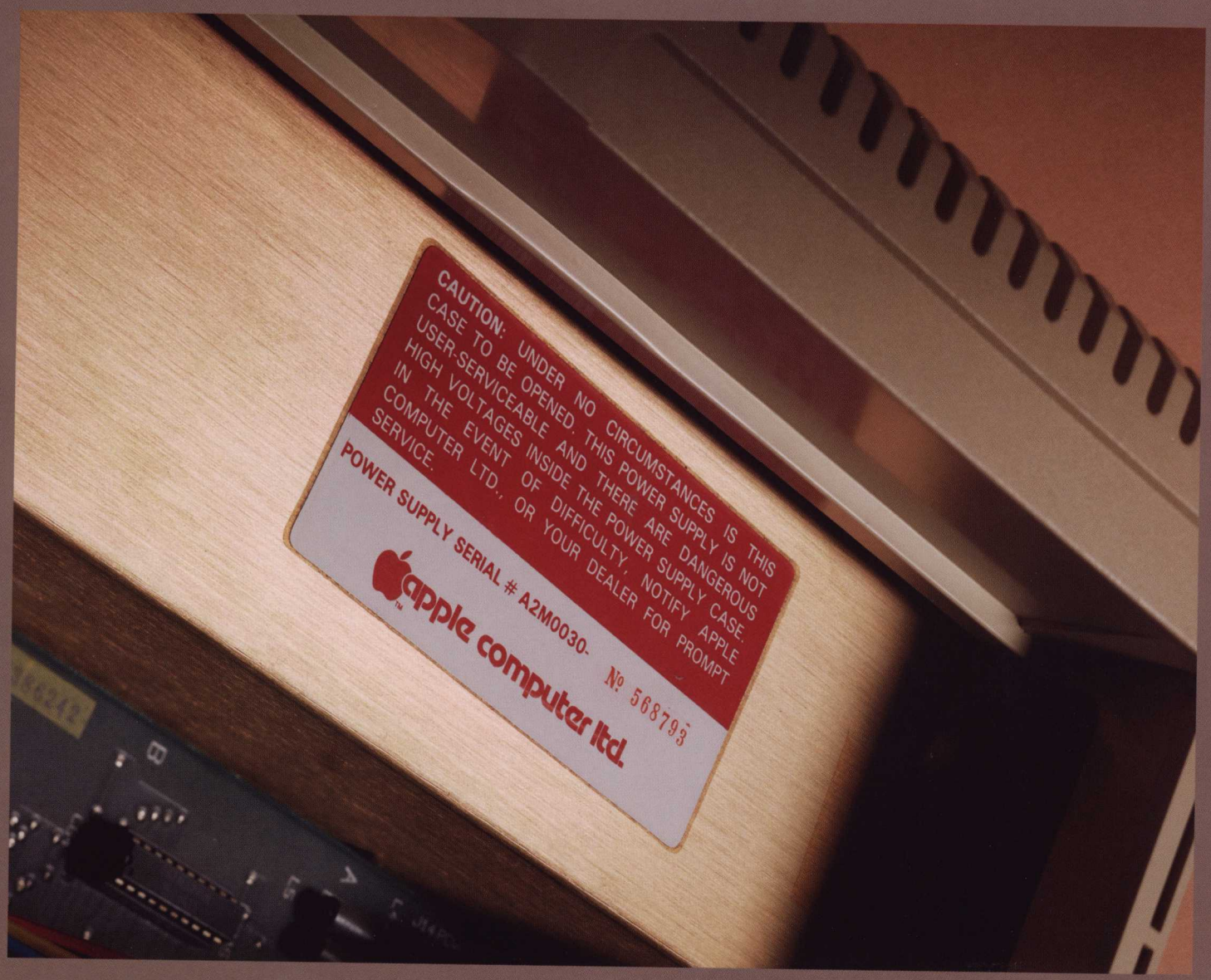
**AVAILABLE**

**TECHNICAL DATA**
Synertek 6502 at 1 MHz, 64 KB RAM

**ORIGIN**
United States

Apple IIe, rear panel detail ↓




Apple IIe, internal power supply ↑

**ORIGIN**
United States

**TECHNICAL DATA**
NEC Z80A at 3.5 MHz, 4 KB RAM

**AVAILABLE**
June 1983

**MANUFACTURER**
Mattel Electronics




It was one of the most short-lived computers ever made. The Mattel Aquarius lasted just four months on the market before it was pulled, the victim of dated hardware design. The toy giant never made a computer again.

Before the release of the Aquarius, Mattel had already carved itself a leading position in the world of computers with the release of the Intellivision gaming console in 1980. It had always intended to release a keyboard-based expansion that would turn the Intellivision into a full computer, but following various issues with build costs and reliability this never came to fruition, causing Mattel, which had advertised it as a feature, to be fined by the Federal Trade Commission for false advertising. In its place came the hurriedly developed BASIC-based Entertainment Computer System add-on, which launched with little real commitment in 1983. By then, the home computer revolution was in full flood and the ECS looked hopelessly backward – and Mattel was already about to release a standalone computer.

Mattel didn't design the Aquarius itself, instead approaching third parties and settling on Hong Kong-based Radofin, which was founded in the mid-1970s and manufactured calculators, TV games, and hardware, including the Intellivision, under contract. It just happened that Radofin already had a Z80-powered design ready to go: Mattel announced it in 1982 and showed it for the first time in January 1983, before releasing it in June.

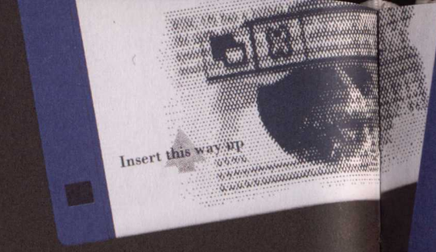
The world was unimpressed. With just 4 KB of RAM, one-voice sound, no sprite support, no programmable characters for graphics, and no game controllers, it was hopelessly outclassed by the incumbent home computers on the market. Mattel reacted, adding an expanded character set that included more graphics options and a series of memory expansion cartridges, alongside various expansions. It even planned two successors, the Aquarius II and III. But sales were so low that the Aquarius was discontinued in October 1983, ending Mattel's attempt to be a computer maker. It wasn't the end of the Aquarius, however. In January 1984, Radofin took all unsold stock and for the next two years manufactured more, distributing it under new names.

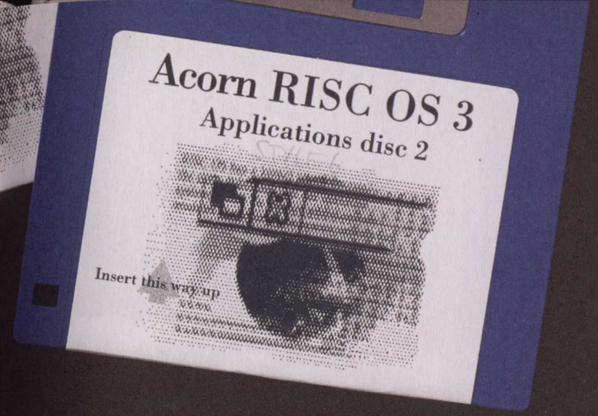


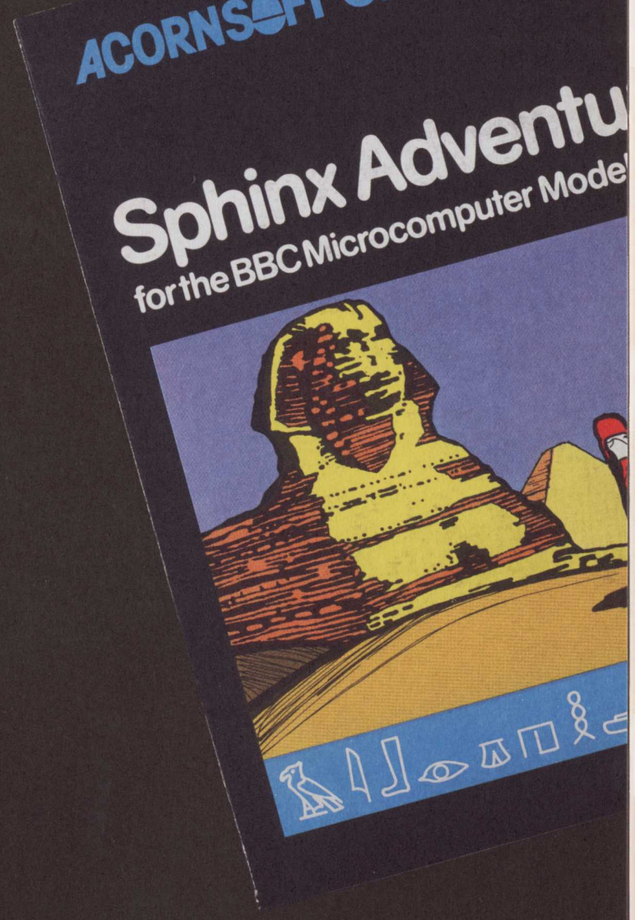

# MATTEL AQUARIUS









Aquarius 4-KB memory cartridge packaging

Tandy 1000 EX MS-DOS software

Acorn Archimedes RISC OS 3 applications disks

BBC Micro *Sphinx Adventure* game



**ORIGIN**
United States

**TECHNICAL DATA**
PowerPC 750 G3 at 233 MHz, 32 MB RAM

# APPLE IMAC G3

**AVAILABLE**
August 1998



**MANUFACTURER**
Apple Computer

Apple had spent much of the 1990s in gentle decline, having failed to define a new product line as iconic as the Macintosh P. 151. Its glumly named Quadra, Performa, and Centris lines were as beige as the boxes they attempted to compete with, and far more expensive because Apple aimed for high profit margins. Newton, an ARM-powered PDA, and W.A.L.T., a stylus-driven phone, could have defined whole new product categories, but Newton was crippled by a high price and issues with its handwriting recognition, and W.A.L.T. was never released.

And all the while, the PC continued to grow. While struggling to update its own operating system, OS 7, which launched in 1991, Apple attempted to sue Microsoft, claiming Windows' 'look and feel' was copied from Macintosh, but the case was thrown out because Apple had licensed its operating system to Microsoft in the mid-1980s. Apple's resurgence came in 1997 when Apple bought NeXT P. 221, and with it, the leadership of Steve Jobs. Within a year, Apple was transformed, with a revitalized vision for what its computers should be, and the most advanced consumer operating system in the world.



Apple iMac G3, carry handle ↑

The iMac G3 was a symbol of all that had changed. After years of chasing the expensive end of the market, the iMac was designed for people. Its curved, semi-transparent case came in bright Bondi blue, making an appealing and tactile object out of a thing that was usually hidden under a desk or merely tolerated on top of one. Principally designed by Danny Coster and later developed by Jonathan Ive, it made a statement about the role of the computer: it should be part of the home. It was the first to ship with USB as standard – an interface that finally made it easy to plug any peripheral into a computer. And, equipped with ethernet and a modem, it also natively connected to the early Internet.

The iMac wasn't only a turning point for Apple; it also represented a watershed for the home microcomputer. Twenty-one years since the Apple II, PET, and TRS-80 kicked off the revolution, computers now played a role in every aspect of daily life. They were providers of entertainment, a place to create, a stage for communication, a source of information. The computer had evolved from a tinkerer's toy to a vital instrument of self-expression for all.



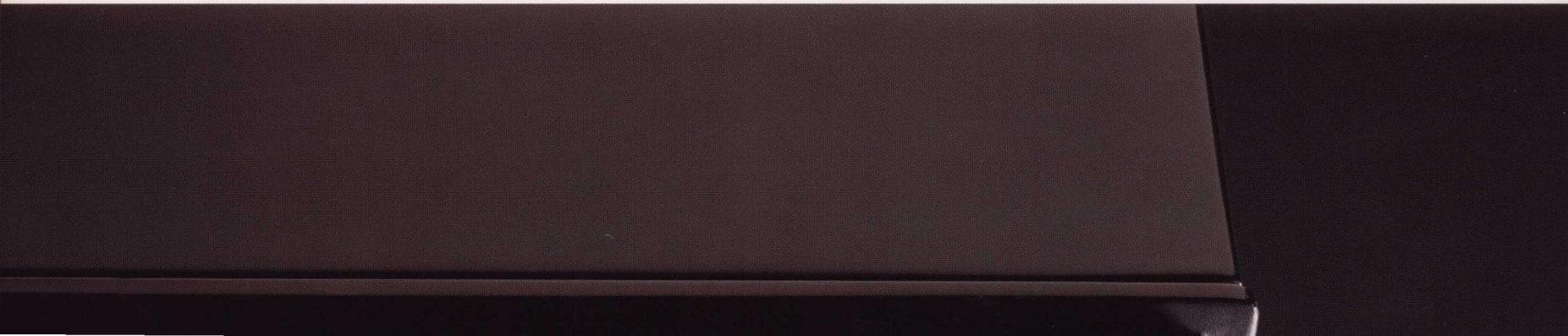

Apple iMac G3, underside ↑

**MANUFACTURER**
NeXT

**AVAILABLE**
October 1988

**TECHNICAL DATA**
Motorola 68030 at 25 MHz,
4 MB–16 MB RAM

**ORIGIN**
United States



# NEXT COMPUTER




Steve Jobs left Apple only a few months after fellow-founder Steve Wozniak. Apple's CEO, John Sculley, had reorganized Jobs away from his beloved Macintosh P. 151, believing that Apple's future lay in avoiding trying to compete with the PC by building computers like the Apple II P. 203 for small businesses and homes. Jobs believed that Apple's future was in powerful, closed-architecture computers such as the Macintosh, but he had been made powerless as head of New Product Development – whatever that meant. In September 1985, following a series of tussles with Sculley for control of Apple, Jobs resigned and, taking several executives with him, founded a new company called NeXT.

NeXT was anxious not to compete with Apple, and the initial idea was to make workstations for higher education that could perform complex scientific analysis and simulations, while also being cheap enough for students to use. But that soon changed. Jobs wanted to make software, too, hiring Avie Tevanian to lead a team to design the next generation of the graphical user interface that the Lisa P. 146 and Macintosh had pioneered. Called NeXTSTEP, it was based on a UNIX core and was the first operating system to implement the object-oriented programming paradigm, which gave powerful control over how data could interact with other data. It also developed and polished many other features that are taken for granted today, such as a permanent dock that gave constant easy access to applications; dragging and dropping text, images, and other media between different applications; large icons; enhanced typography; and a 3D look. And it was all contained within a foot-long black magnesium cube fashioned by Frog Design, with a $100,000 logo designed by graphic designer Paul Rand.

The NeXT Computer was the finest expression yet of Jobs's uncompromising melding of hardware, software, and visual design, and it naturally came at a cost. A price tag of $6,500 meant that it competed with neither Apple nor IBM, but its legacy is incontrovertible. It was used by Tim Berners-Lee to write WorldWideWeb, the first web browser, and the first web server software, and by id Software to create the game *Doom*. In 1990, NeXT released a new version, the NeXTcube, but it wasn't until NeXTSTEP was converted to run on Intel processors in 1993 that the company finally turned a profit.



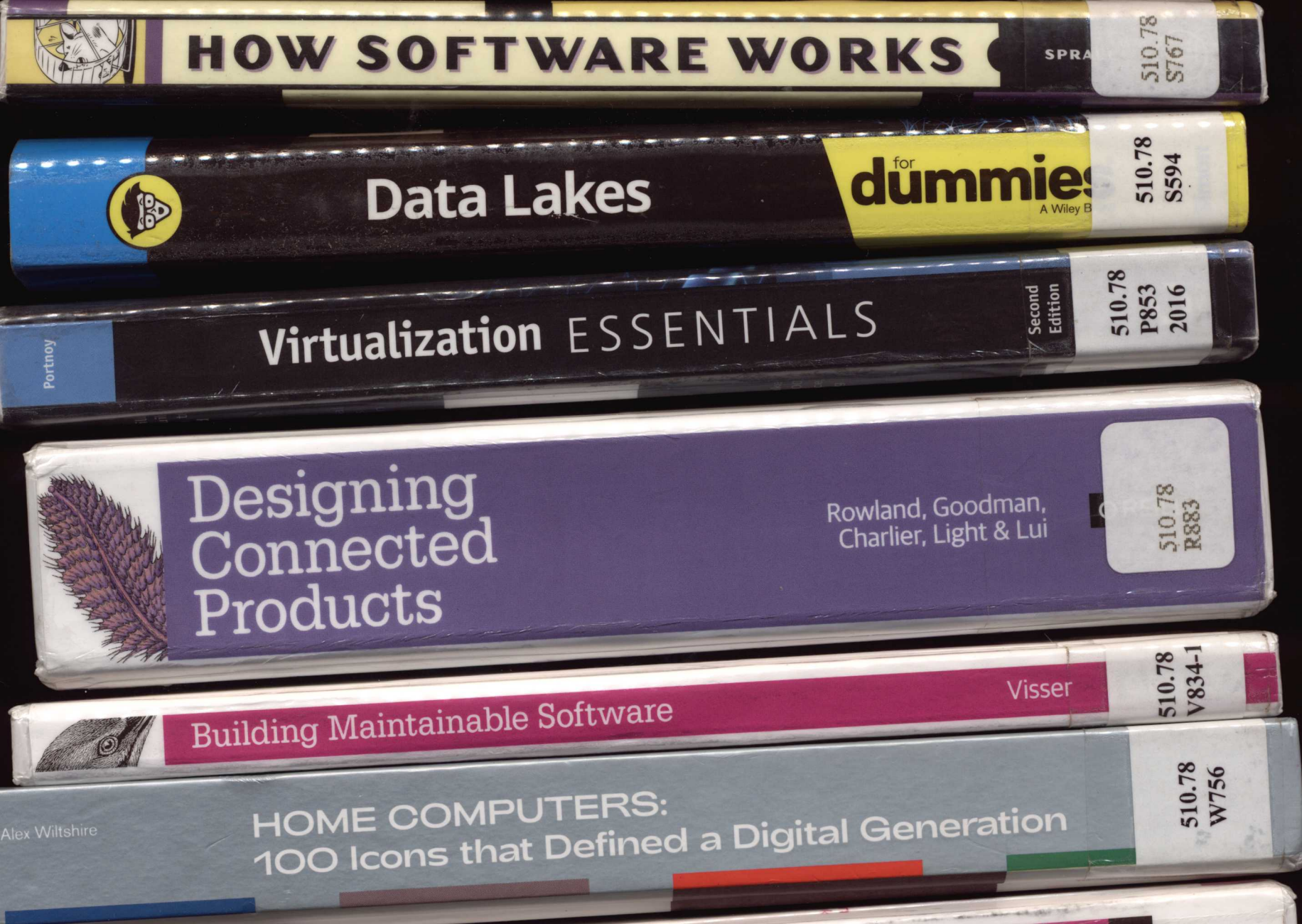
**MANUFACTURER**
NeXT

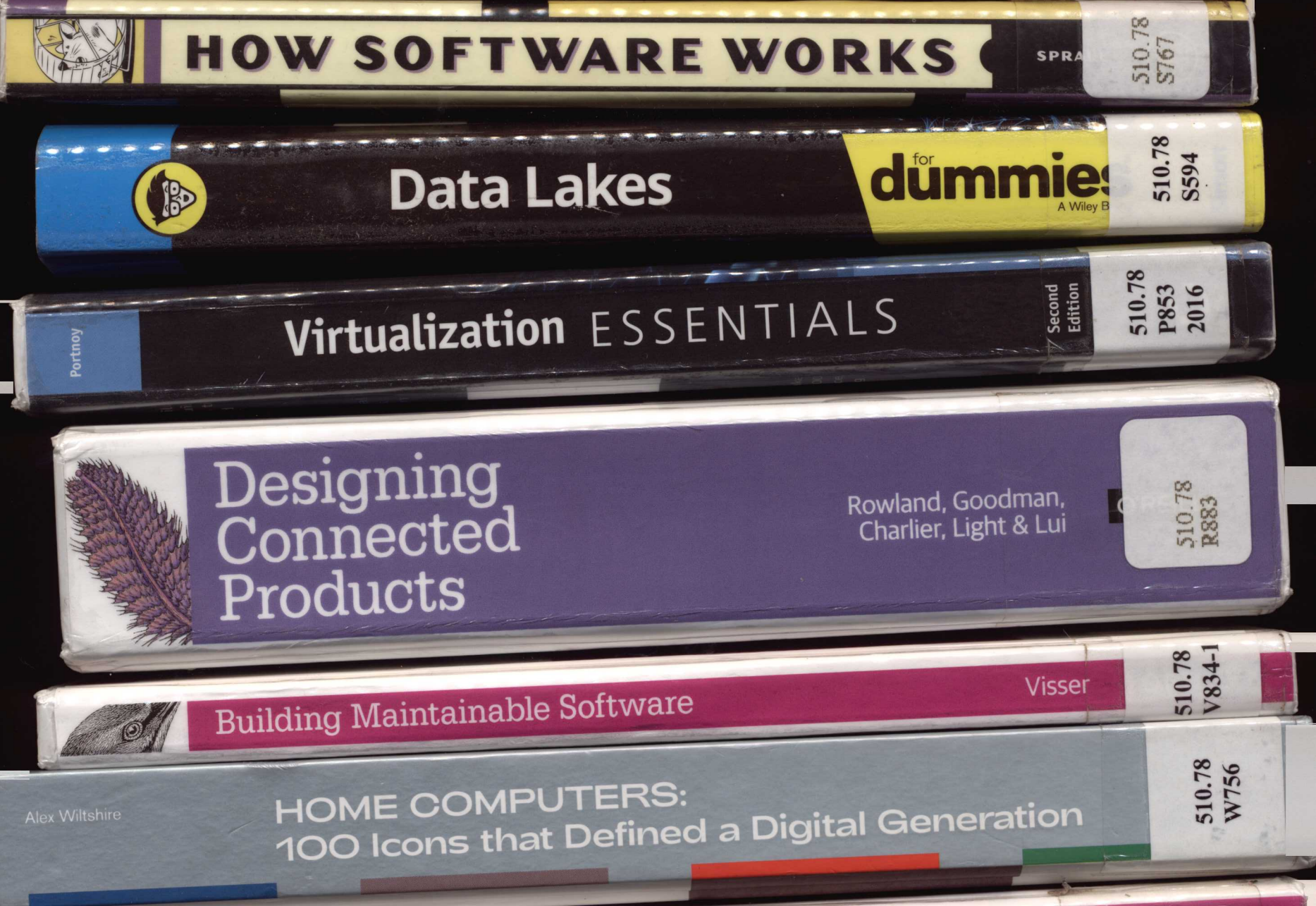
**AVAILABLE**
October 1988

**TECHNICAL DATA**
Motorola 68030 at 25 MHz,
4 MB–16 MB RAM

**ORIGIN**
United States




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